



DEPARTMENT OF TRANSPORTATION
HAZARDOUS MATERIALS REGULATIONS BOARD
WASHINGTON, D.C. 20590

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[Docket No. HM-90; Notice No. 71-24]

TRANSPORTATION OF HAZARDOUS
MATERIALS

Specifications for Tank Cars

The Hazardous Materials Regulations Board is considering amendment of Part 179 of the Hazardous Materials Regulations to update tank car specification requirements and to add new tank car specifications. Suitable corresponding changes would be made to Part 173 for commodities when the amendment is published. These proposed amendments are almost entirely based on requests submitted by the Association of American Railroads (AAR). These requests are based largely on experience gained under a very significant number of outstanding special permits.

These proposals are set forth in the type of detailed specifications that have been used for many years in this field. As has been mentioned frequently, it is the Board's intention in the future to prescribe minimum performance type requirements rather than detailed specification requirements. However, in view of the substantial amount of time and effort of both the industry and the Federal Railroad Administration that can be saved through the elimination of many special permits, it is desirable to issue this proposal in the traditional specification form rather than to let the existing situation stand while performance specifications are developed.

The major changes proposed are discussed in this preamble. Numerous editorial changes relating to clarification of text and updating of references are not specifically highlighted.

Section 179.2(a)(4) would be amended to indicate that "DOT" identifies the Department of Transportation. Section 179.5 would be revised to assure completeness of Bureau of Explosives and AAR Mechanical Division files. The Department does not maintain such records.

In § 179.6, reference would be made to Appendix R of the AAR Specifications for Tank Cars. Section 179.12-2(b) would permit a 20 percent reduction in carbon steel pipe, if welded, and would reflect provisions that have been incorporated in other tank car standards for many years.

Section 179.100, Pressure Tank Car Tanks, in addition to updating section cross-references and incorporating references to various appendices of the AAR Specifications for Tank Cars, would require, at subsection 4, that the jacket covering insulation be of a thickness not less than 11 gage. At subsection 6, more stringent requirements would be added to assure that tank plates are not reduced during forming below specification requirements. Also the welded joint efficiency factor change to 1.0 would recognize improvements in welding and weld inspection over the years in addition to the fact that all such tank welds are 100

percent radiographed. In subsection 7, the tables would be revised to update the requirements by deleting obsolete material specifications and by adding new specifications currently in use under special permits. In subsection 10, the phrase "postweld heat treatment" would be substituted for the phrase "stress relieving" to agree with terminology used in other codes such as the ASME Code. This change is also repeated later in the text. In subsection 12, minimum requirements would be added for the size and number of studs and the minimum thickness of material for dome housings. Subsection 13 would be amended by providing for the addition of a sump or siphon to the bottom of a tank. Subsection 14 would define more clearly the limitation on extreme projection of bottom outlets on cars. Paragraph (a)(5) would require a screw plug on closure which has been standard approved practice, but never specified heretofore. Subsection 15(a) would be changed to be consistent with § 179.100-1 which includes valve flow rating pressures for safety-relief valves. Subsection 15(b) would require the safety-relief valve on specification 105A500W tanks to be set for a start-to-discharge pressure of 360 p.s.i. in keeping with current practice. Subsection 16 would specify use of reinforcing pads to distribute stresses and to prevent punctures and tearing of a tank by attachments. Subsection 21 would require a water capacity stencil on a pressure tank to provide additional information to loading personnel to prevent overfilling.

Section 179.101 would provide for the construction of tank cars to new specification 114A400W. At the same time, provisions would be made for specifying valve flow rating pressure, for use of white paint in place of "reflecting paint", and for bottom outlets on certain cars.

Section 179.102 would be amended to include new requirements for cars in service transporting liquefied carbon dioxide, liquefied flammable gases, vinyl chloride, inhibited vinyl methyl ether, ethylene oxide, anhydrous hydrofluoric acid, inhibited acrolein, metallic sodium, stabilized sulfur trioxide, flammable liquids, n.o.s., and unsymmetrical dimethyl hydrazine. Provisions for the alternate setting of safety-relief valves on butadiene and vinyl chloride tank cars, for flow rating data, and for gasketing are included.

Section 179.103 is proposed to be amended to specify minimum requirements for a protective housing with cover, to eliminate the requirement for excess flow valves when the lading is nonflammable, and to broaden the application of § 179.103-4 to safety-relief devices and pressure regulators. Subsection 5 would be added to provide specific requirements for approved bottom outlet valves.

Section 179.200, general specifications applicable to nonpressure tank car tanks, would be amended to make substantive changes in subsections 3, 4, 6, 7, 8, 10,

15, 16, 17, 19, and 24. Subsection 4 would require insulation on tanks to be covered with a metal jacket not less than 11 gage. Subsection 6 would be clarified to assure that thickness of tank plate is not reduced during forming below specification requirements. Also the weld joint efficiency factor would be 1.0 for seamless heads of all tanks. In subsection 7, the tables would be revised to update the requirements by deleting obsolete material specifications and by adding new specifications currently in use under special permits. Subsection 8 would be amended to require 2:1 ellipsoidal heads for class 111A tank car tanks, except for internal compartment heads. Subsection 10 would specify that welding to certain fittings is not authorized. Subsection 15 would be amended to delete reference to AAR specification M-402, Grade 35018, malleable iron castings. Subsection 16 would require the application of shutoff valves at specific locations on the tank when top loading and discharge devices are installed, would set design parameters for sumps and siphon bowls, would provide protection for certain fittings, and would specify minimum requirements for protective housings. Subsection 17 would define more clearly the design criteria and a limitation on extreme projection of bottom outlets on cars with truck centers less than or greater than 60 feet 6 inches. Subsection 19 would specify use of reinforcing pads to distribute stresses and to prevent punctures and tearing of a tank by attachments. Subsection 24 would add a paragraph (b) to provide an abbreviated marking for class 111A tank car tanks by omitting the suffix numeral.

Section 179.201-1 would be amended to provide for the construction of tank cars to new specifications 111A100ALW, 111A60W2, 111A60W5, ~~111A60W6~~, ~~111A60W7~~, 111A60W1, 111A60ALW2, 111A100ALW1, 111A100ALW2, and 111A60W7. Subsection 3 would be changed to make distinct the requirements applying to rubber-lined tanks and tanks lined with material other than rubber. Subsections 4, 5, and 6 would be changed to adopt by reference the requirements specified in Appendix M of AAR Specifications for Tank Cars. Subsection 7 would require safety relief devices to comply with § 179.200-18. Subsection 9 would be amended to indicate that an excess flow valve is not needed if the gaging device does not allow passage of the lading when the device is in operation.

Section 179.202 is also proposed to be changed. Most revisions would be editorial in nature. Subsection 9 would be amended to add requirements for sodium chlorite. Subsections 12 would provide for a frangible disc to be made from other materials than lead. In subsection 14, authorization for use of Type 347 stainless steel would be deleted and addition of special safety valve requirements would be made. Subsection 18 would be amended to prohibit the use

of copper or copper bearing alloys. Subsections 20, 21, and 22 would be added to provide special commodity requirements for hydrofluoric acid, nitric acid, and mixed acids.

In §§ 179.300-6 and 179.300-8 more stringent requirements would be added to assure that tank plates are not reduced during forming below specification requirements. In subsection 7 the table would be revised to update the requirements by deleting obsolete material specifications and by adding new specifications currently in use under special permits. In subsection 17 the tests for frangible discs of safety vents would be required to comply with Appendix A of the AAR Specifications for Tank Cars.

The change to § 179.302 would rearrange the commodities in alphabetical order and would consolidate the family of aluminum alkyls (pyroforic materials) under the generic description, "pyroforic liquid, n.o.s."

In consideration of the foregoing, it is proposed to amend 49 CFR Part 179 as follows:

(A) In Part 179 Table of Contents, Subpart C and §§ 179.200, 179.300, and 179.302 would be amended to read as follows:

Subpart C—Specifications for Pressure Tank Car Tanks (Classes DOT-105, 109, 112, and 114)

- Secs.
- 179.200 General specifications applicable to nonpressure tank car tanks (Classes DOT-103, 104, 111).
- 179.300 General specifications applicable to multiunit tank car tanks designed to be removed from car structure for filling and emptying (Classes DOT-106, and 110).
- 179.302 Special commodity requirements for multiunit tank car tanks.

(B) In § 179.2, paragraph (a) (4) would be amended to read as follows:

§ 179.2 Definitions and abbreviations.

- (a) * * *
- (4) "DOT" and "Department" means Department of Transportation.

(C) Section 179.5 would be amended to read as follows:

§ 179.5 Certificate of construction.

(a) Except as provided in paragraph (b) of this section, before a tank car is placed in service, the party assembling the completed car shall furnish a Certificate of Construction, Form AAR 4-2 to the owner, the Bureau of Explosives (as required by paragraph (d) of this section), and the Secretary, Mechanical Division, AAR, certifying that the tank, equipment, and car comply with all the requirements of the specification.

(b) Before a tank of Class DOT-106A, 107A, or 110A is placed in service, the builder must furnish a Certificate of Construction, Form AAR 4-2 to the owner, the Bureau of Explosives (as required by paragraph (d) of this section), and the Secretary, Mechanical Division, AAR, in addition to a Certificate of Inspector's Report as required in §§ 179.300-20 and 179.500-18 in prescribed form certifying that the tank and appurtenances comply with all the requirements of the specifications.

(c) If the owner elects to furnish the appurtenances such as valves and safety devices, the owner shall furnish to the Bureau of Explosives, and to the Secretary, Mechanical Division, AAR, a report

in prescribed form, certifying that the appurtenances comply with all the requirements of the specifications.

(d) When cars or tanks which are covered on one application and are identical in all details are built in series, one certificate shall suffice for each series when submitted to the Secretary. One copy of the Certificate of Construction must be furnished to the Bureau of Explosives for each car number or consecutively numbered group or groups covered by the original application.

(D) Section 179.6 would be amended to read as follows:

§ 179.6 Repairs and alterations.

For procedure to be followed in making repairs or alterations, see Appendix R of the AAR Specifications for Tank Cars.

(E) In § 179.12-2, paragraph (b) would be amended to read as follows:

Material	Nominal thickness minimum ¹		Specifications ASTM
	2 inches	Over 2 inches	
Carbon steel.....	0.175.....	Schedule 40.....	A53-69a, A192-69, A178-70.
Alloy steel.....	Schedule 40S.....	Schedule 40S.....	A312-70, A269-69.
Aluminum.....	Schedule 80.....	Schedule 80.....	B241-69, B210-70, B221-69.
Nickel.....	Schedule 40.....	Schedule 40.....	B161-70.

¹ Thickness must be increased 25 percent or to next higher schedule, whichever is less, when threaded joints are used.

(F) Subpart C heading would be amended to read as follows:

Subpart C—Specifications for Pressure Tank Car Tanks (Classes DOT-105, 109, 112, and 114)

(G) In § 179.100-3 paragraph (a), the last sentence would be amended to read as follows: "Other openings in the tank are prohibited, except as provided in Part 173 of this chapter, §§ 179.100-14, 179.101-1(a) Table Note 11, § 179.102 or § 179.103." In § 179.100-4, paragraph (a) would be amended; in § 179.100-6, paragraph (a) would be amended; §§ 179.100-7 and 179.100-100 would be amended; in § 179.100-12, paragraphs (a) and (c) would be amended; in § 179.100-13, paragraph (e) would be added; in § 179.100-14, paragraphs (a) (1) and (3) would be amended, paragraph (a) (5) would be redesignated (a) (6), a new paragraph (a) (5) would be added; in § 179.100-15, paragraphs (a), (b), and (c) would be amended; in § 179.100-16, the heading would be amended, paragraph (a) would be redesignated paragraph (b), a new paragraph (a) would be added; in § 179.100-20 paragraph (a) table, the second entry would be amended to read: "Material ----- ASTM A515-70"; in § 179.100-21, paragraph (b) would be added to read as follows:

§ 179.100 General specification applicable to pressure tank car tanks.

§ 179.100-4 Insulation.

(a) If insulation is applied, the tank shell and manway nozzle must be insulated with an approved material. The entire insulation must be covered with a metal jacket of a thickness not less than 11 gage (0.1196 inch) nominal (manufacturers' standard gage) and flashed around all openings so as to be weather-tight. The exterior surface of a carbon steel tank, and the inside surface of a carbon steel jacket must be given a protective coating except that a protective coating is not required when foam-in-place insulation that adheres to the tank or jacket is applied.

§ 179.12-2 Materials and dimensions.

(b) Piping must be not less than 2 inches IPS. Tubing must be not less than 2 3/8 inches outside diameter and the wall thickness must be at least equivalent to the corresponding pipe size. Material specifications and nominal wall thickness must be as follows:

§ 179.100-6 Thickness of plates.

(a) The wall thickness after forming of the tank shell and heads must not be less than that specified in § 179.101, nor that calculated by the following formula:

$$t = \frac{Pd}{2SE}$$

where:

- d = Inside diameter in inches;
 E = 1.0 welded joint efficiency; except for heads with seams = 0.9;
 P = Minimum required bursting pressure in p.s.i.;
 S = Minimum tensile strength of plate material in p.s.i., as prescribed in § 179.100-7;
 t = Minimum thickness of plate in inches after forming.

§ 179.100-7 Materials.

(a) *Steel plate.* Steel plate materials used to fabricate tank shell and manway nozzle must comply with one of the following specifications with the indicated minimum tensile strength and elongation in the welded condition. The maximum allowable carbon content must be 0.31 percent when the individual specification allows carbon greater than this amount. The plates may be clad with other approved materials.

Specifications	Minimum tensile strength (p.s.i.) welded condition ¹	Minimum elongation in 2 inches (percent) welded condition (longitudinal)
ASTM A 515-69, Gr. 55.....	55,000	28
ASTM A 515-69, Gr. 60.....	60,000	25
ASTM A 515-69, Gr. 65.....	65,000	20
ASTM A 515-69, Gr. 70.....	70,000	20
ASTM A 285-69, Gr. A.....	45,000	29
ASTM A 285-69, Gr. B.....	50,000	20
ASTM A 285-69, Gr. C.....	55,000	20
ASTM A 516-70, Gr. 55.....	55,000	28
ASTM A 516-70, Gr. 60.....	60,000	25
ASTM A 516-70, Gr. 65.....	65,000	20
ASTM A 516-70, Gr. 70.....	70,000	20
AAR TC128-70, Gr. A.....		
and B.....	81,000	19
ASTM A 537-69, Gr. A.....	70,000	23
ASTM A 302-69a, Gr. A.....	80,000	20

¹ Maximum stresses to be used in calculations.

(b) **Aluminum alloy plate.** Aluminum alloy plate material used to fabricate tank shell and manway nozzle must be suitable for fusion welding and must comply with one of the following specifications with its indicated minimum tensile strength and elongation in the welded condition.

Specifications	Minimum tensile strength (p.s.i.) 0 temper, welded condition ²	Minimum elongation in 2 inches (percent) 0 temper, welded condition (longitudinal)
ASTM B 209-70, Alloy 5052 ¹	25,000	18
ASTM B 209-70, Alloy 5083 ²	38,000	16
ASTM B 209-70, Alloy 5088 ¹	35,000	14
ASTM B 209-70, Alloy 5154 ¹	30,000	18
ASTM B 209-67, Alloy 5254 ¹	30,000	18
ASTM B 209-70, Alloy 5454 ¹	31,000	18
ASTM B 209-67, Alloy 5652 ¹	25,000	18
ASTM B 209-70, Alloy 6061 ¹	24,000	15

¹ For fabrication, the parent plate material may be 0, H112, or H32 temper, but design calculations must be based on minimum tensile strength shown.

² 0 temper only.

³ Weld filler metal 5556 must not be used.

⁴ Not authorized for tank shells, manways or domes.

⁵ T6 temper only.

⁶ Maximum stress to be used in calculations.

(c) All attachments welded to tank shell must be of approved material which is suitable for welding to the tank.

§ 179.100-10 Postweld heat treatment.

(a) After welding is complete, steel tanks and all attachments welded thereto must be postweld heat treated as a unit in compliance with the requirements of AAR Specifications for Tank Cars, Appendix W.

(b) For aluminum tanks, postweld heat treatment is prohibited.

§ 179.100-12 Manway nozzle, cover and protective housing.

(a) Manway nozzles must be of approved design of forged or rolled steel for steel tanks or of fabricated aluminum alloy for aluminum tanks, with access opening at least 18 inches inside diameter, or at least 14 inches by 18 inches obround or oval. Nozzle must be welded to the tank and the opening reinforced in an approved manner in compliance with the requirements of AAR Specifications for Tank Cars, Appendix E, Figure E10.

(c) Except as provided in § 179.103, protective housing of cast, forged or fabricated approved materials must be bolted to manway cover with not less than twenty 3/4-inch studs. The shearing value of the bolts attaching protective housing to manway cover must not exceed 70 percent of the shearing value of bolts attaching manway cover to manway nozzle. Housing must have steel sidewalls not less than three-fourths inch in thickness and must be equipped with a metal cover not less than one-fourth inch in thickness that can be securely

closed. Housing cover must have suitable stop to prevent cover striking loading and unloading connections and be hinged on one side only with approved riveted pin or rod with nuts and cotters. Openings in wall of housing must be equipped with screw plugs or other closures.

§ 179.100-13 Venting, loading and unloading valves, measuring and sampling devices.

(e) Bottom of tank shell may be equipped with a sump or siphon bowl welded or pressed into the shell. Such sumps or siphon bowls, if applied, are not limited in size and must be made of cast, forged, or fabricated metal. Each sump or siphon bowl must be of good welding quality in conjunction with the metal of the tank shell. When the sump or siphon bowl is pressed in the bottom of the tank shell, the wall thickness of the pressed section must not be less than that specified for the shell. The section of a circular cross section tank to which a sump or siphon bowl is attached need not comply with the out-of-roundness requirement specified in AAR Specifications for Tank Cars, Appendix W, W14.06. Any portion of a sump or siphon bowl not forming a part of cylinder of revolution must have walls of such thickness and be so reinforced that the stresses in the walls caused by a given internal pressure are no greater than the circumferential stress which would exist under the same internal pressure in the wall of a tank of circular cross section designed in accordance with § 179.100-6(a). In no case less than that specified in § 179.101-1(a).

§ 179.100-14 Bottom outlets.

(1) On newly built and empty cars with truck centers through 60 feet, 6 inches, the extreme projection of the bottom washout equipment must be at least 12 inches above the top of rail on level track. On cars with truck centers greater than 60 feet, 6 inches, the minimum rail clearance must be in accordance with the graph in Appendix E of the AAR Specifications for Tank Cars.

(3) If the bottom washout nozzle extends 6 inches or more from shell of tank, a "V" groove must be cut (not cast) in the upper part of the nozzle at a point immediately below the lowest part of inside closure seat or plug to a depth that will leave wall thickness of nozzle at the root of the "V" not over one-fourth inch. Where nozzle is not a single piece, provision must be made for the equivalent of the breakage groove. The nozzle must be of a thickness to insure that accidental breakage will occur at or below the "V" groove or its equivalent. On cars without continuous center sills, the breakage groove or its equivalent must not be more than 15 inches below the tank shell. On cars with continuous center sills, the breakage groove or its equivalent must be above the bottom of the center sill construction.

(5) The closure of the washout nozzle must be equipped with a 3/4-inch solid screw plug. Plug must be attached by at least a 1/4-inch chain.

(6) Joints between closures and their seats may be gasketed with suitable material.

§ 179.100-15 Safety relief valves.

(a) The tank must be equipped with one or more safety relief valves of approved design, made of metal not subject to rapid deterioration by the lading. The safety relief valve, or valves, must be mounted on manway cover, except as provided in § 179.103. The total valve discharge capacity must be sufficient to prevent building up pressure in tank in excess of 82 1/2 percent of the tank test pressure or 10 p.s.i. above the start-to-discharge pressure, whichever is higher. The start-to-discharge and vapor-tight pressures must comply with § 179.101 and must not be affected by any auxiliary closure or other combination. For certain commodities, alternate pressures are permitted (see § 179.102-11). See AAR Specifications for Tank Cars, Appendix A, for formula for calculating discharge capacity.

(b) When a safety relief valve is used in combination with a breaking pin device, the breaking pin device must be designed to fail at a pressure of 75 percent of the tank test pressure and safety relief valve must be set for a start-to-discharge pressure of 71 percent of the tank test pressure. However, for spec. DOT-105A500W tanks, the start-to-discharge pressure must be 360 p.s.i.

(c) When a safety relief valve is used in combination with a frangible disc, the frangible disc must be designed to burst at a pressure of 75 percent of the tank test pressure and the safety relief valve must be set for a start-to-discharge pressure of 71 percent of the tank test pressure, as prescribed in § 179.101. Provisions must be made to prevent any accumulation of pressure between the frangible disc and safety relief valve.

§ 179.100-16 Attachments.

(a) Reinforcing pads must be used between external brackets and shells if the attachment welds exceed 6 linear inches of 1/4-inch fillet or equivalent weld per bracket or bracket leg. When reinforcing pads are used, they must not be less than one-quarter inch in thickness, have each corner rounded to a 1 inch minimum radius, and be attached to the tank by continuous fillet welds except for venting provisions. The ultimate shear strength of the bracket-to-reinforcing pad weld must not exceed 85 percent of the ultimate shear strength of the reinforcing pad-to-tank weld.

§ 179.100-21 Stenciling.

(b) Water capacity stencil is required.

(H) In § 179.101-1 paragraph (a), the table would be amended in its entirety to read as follows:

§ 179.101 Individual specification requirements applicable to pressure tank car tanks.

§ 179.101-1 Individual specification requirements.

(a) * * *

DOT specifications	105A100ALW	105A100W	105A200ALW	105A200F	105A200W	105A300ALW	105A300W	105A400W	105A500W	105A600W
Material (see 179.100-7)	Al alloy	Steel	Al alloy	Steel	Steel	Al alloy	Steel	Steel	Steel	Steel
Insulation (see 179.100-4)	Required	Required	Required	Required	Required	Required	Required	Required	Required	Required
Bursting pressure, p.s.i. (see 179.100-5)	500	500	500	500	500	750	750	1,000	1,250	1,500
Minimum plate thickness, inches, shell and heads	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{11}{16}$
Test pressure, p.s.i. (see 179.100-18)	100	100	200	See 179.104	200	300	300	400	500	600
Safety relief valves, p.s.i.: ^a										
Start-to-discharge	75	75	150	150	150	225	225	300	375	450
Pressure, p.s.i.										
Start-to-discharge	± 3.0	± 3.0	± 4.5	± 4.5	± 4.5	± 6.75	± 6.75	± 9.0	± 11.25	± 13.5
Tolerance, p.s.i.										
Vapor tight (minimum)	60	60	120	120	120	180	180	240	300	360
Pressure, p.s.i.										
Valve flow rating pressure (p.s.i. minimum)	85	85	165	165	165	247.5	247.5	330	412.5	495
Manway cover, thickness, inches (minimum)	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$
Special references	179.102-3	179.102-3	179.102-3	179.102-3	179.102-3	179.102-3	179.102-2	179.102-3	179.102-1	179.102-1
	179.102-12	179.102-6	179.102-6	179.102-6	179.102-6	179.102-6	179.102-5	179.102-6	179.102-3	179.102-3
		179.102-17	179.102-17	179.104	179.102-17		179.102-6	179.102-6	179.102-9	179.102-9
		179.102-20					179.102-7	179.102-7	179.102-10	179.102-10
							179.102-8	179.102-8	179.102-14	179.102-14
							179.102-11	179.102-11	179.102-17	179.102-17
							179.102-13	179.102-13	179.102-18	179.102-18
							179.102-16			
							179.102-17			
Bottom washout	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited
Bottom outlet	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited

DOT specifications	109A100ALW	109A200ALW	109A300ALW	109A300W	112A200W	112A340W	112A400F ¹¹	112A400W	112A500W	114A340W	114A400W
Material (see 179.100-7)	Al alloy	Al alloy	Al alloy	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel
Insulation (see 179.100-4)	Optional	Optional	Optional	Optional	None	None	None	None	None	None	None
Bursting pressure, p.s.i. (see 179.100-5)	500	500	750	750	500	850		1,000	1,250	850	1,000
Minimum plate thickness, inches, shell and heads	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{11}{16}$		$\frac{11}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{11}{16}$
Test pressure, p.s.i. (see 179.100-18)	100	200	300	300	200	340		400	500	340	400
Safety relief valves, p.s.i.: ^a											
Start-to-discharge	75	150	225	225	150	255		300	375	255	300
Pressure, p.s.i.											
Start-to-discharge	± 3.0	± 4.5	± 6.75	± 6.75	± 4.5	± 7.65		± 9.0	± 11.25	± 7.65	± 9.0
Tolerance, p.s.i.											
Vapor tight (minimum)	60	120	180	180	120	204		240	300	204	240
Pressure, p.s.i.											
Valve flow rating	85	165	247.5	247.5	165	280.5		330	412.5	280.5	330
Pressure (maximum p.s.i.)											
Manway cover, thickness, inches, (minimum)	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$		$\frac{3}{4}$	$\frac{3}{4}$	(7)	(7)
Special references					179.102-3	179.102-3	179.102-17	179.102-6	179.102-17	179.103	179.103
					179.102-17	179.102-17		179.102-11	179.102-17	179.103	179.103
								179.102-11			
								179.102-13			
								179.102-17			
Bottom washout	Optional	Optional	Optional	Optional	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Optional	Optional
Bottom outlet	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited

¹ When steel of 65,000 to 81,000 p.s.i. minimum tensile strength is used, the thickness of plates shall be not less than $\frac{5}{8}$ inch, and when steel of 81,000 p.s.i. minimum tensile strength is used, the minimum thickness of plate shall be not less than $\frac{11}{16}$ inch.

² When approved material other than aluminum alloys are used, the thickness shall be not less than $\frac{3}{4}$ inch.

³ When steel of 65,000 p.s.i. minimum tensile strength is used, minimum thickness of plates shall be not less than $\frac{3}{4}$ inch.

⁴ At least the upper two-thirds of the exterior of the tank, manway nozzle and all appurtenances in contact with this area of the tank shall have a finish coat of white paint.

⁵ For inside diameter of 87 inches or less, the thickness of plates shall be not less than $\frac{1}{2}$ inch.

⁶ See 179.102-11 for optional setting for certain commodities.

⁷ See AAR specifications for tank cars, appendix E, E4.01 and 179.103-2.

⁸ Purposely left blank.

⁹ When the use of nickel is required by the lading, the thickness shall not be less than 2 inches.

¹⁰ Each tank head may be equipped with not more than one opening for use in purging tank interior.

¹¹ Tanks converted to DOT-112A400F from existing forge-welded specification DOT-105A500 tanks by modification using conversion details complying with DOT-112A400W specification requirements, shall be stenciled by substituting the letter "F" for the letter "W" in the specification designation.

(I) In § 179.102-1, the introductory text of paragraph (a) and (a)(1) would be amended; in § 179.102-3, paragraph (a) would be amended; in § 179.102-5, the introductory text of paragraph (a) would be amended; in § 179.102-6, paragraph (a) would be amended; in § 179.102-7, the introductory text of paragraph (a) would be amended; in § 179.102-8, the heading and the introductory text of paragraph (a) would be amended; in §§ 179.102-9 and 179.102-10, the introductory text of paragraph (a) would be amended; § 179.102-11 would be amend-

ed; §§ 179.102-12 through 179.102-17 and 179.102-20 would be added to read as follows:

§ 179.102 Special commodity requirements for pressure tank car tanks.

§ 179.102-1 Liquefied carbon dioxide.

(a) Tank cars used to transport liquefied carbon dioxide must comply with the following special requirements:

(1) All plates for tank, manway nozzle, and anchorage of tanks used in the transportation of liquid carbon dioxide

must be made of carbon steel complying with ASTM Specification A300-68, Class 1. Impact specimens must be Type A Charpy V-notch as shown in ASTM Specification A370-68 and must meet the impact requirements at minus 50° F. using steel meeting requirements of ASTM Specification A516-70, Grade 55, 60, 65, or 70, or AAR Specification TC128-70, Grade B. Production-welded test plates prepared as required by W4.00 of AAR Specifications for Tank Cars, Appendix W, must include impact test specimens of weld metal and heat-affected zone.

(b) Type A Charpy V-notch, prepared and tested in accordance with W9.00 of AAR Specifications for Tank Cars, Appendix W, and these must meet the same impact requirements as the plate material at minus 50° F.

§ 179.102-3 Liquefied flammable gases.

(a) Any authorized tank car used to transport liquefied flammable gases must comply with the following special requirements:

(1) The interior pipes of the loading and unloading valves and sampling valves, also the gaging device when it provides a means for passage of the lading from the interior to the exterior of the tank, must be equipped with excess flow valves of an approved design.

(2) The protective housing cover must be provided with an opening above each safety relief valve which must be concentric with the discharge of the valve and have an area at least equal to the valve outlet area. Each opening must be provided with a weatherproof cover designed for vertical discharge.

(3) Gaskets for manway cover plates and for mounting of fittings must be asbestos type or approved high-temperature resistant equivalent.

§ 179.102-5 Nitrosyl chloride.

(a) Tank cars used to transport nitrosyl chloride must comply with the following special requirements:

§ 179.102-6 Vinyl chloride or vinyl methyl ether, inhibited.

(a) Tank cars used to transport vinyl chloride, or vinyl methyl ether, inhibited, must comply with the following special requirements:

(1) All parts of valves and safety relief devices in contact with the lading must be of a metal or other material suitably treated, if necessary, which will not cause formation of any acetylides.

(2) The interior pipes of the loading and unloading valves and sampling valve, also the gaging device when it provides a means for passage of the lading from the interior to the exterior of the tank, must be equipped with excess flow valves of an approved design.

(3) For vinyl chloride in specifications DOT-105A200W tank cars, openings in tank heads to facilitate nickel lining are authorized if closed in an approved manner.

(4) For alternate safety relief valve settings, see § 179.102-11.

(5) For gasket requirements, see § 179.102-11(b).

§ 179.102-7 Bromine.

(a) Tank cars used to transport bromine must comply with the following special requirements:

§ 179.102-8 Motor fuel antiknock compound.

(a) Tank cars used to transport motor fuel antiknock compounds must comply with the following special requirements:

§ 179.102-9 Nitrogen tetroxide or nitrogen tetroxide-nitric oxide mixtures.

(a) Tank cars used to transport nitrogen tetroxide or nitrogen tetroxide-nitric oxide mixtures must comply with the following special requirements:

§ 179.102-10 Hydrocyanic acid.

(a) Tank cars used to transport hydrocyanic acid must comply with the following special requirements:

§ 179.102-11 Liquefied petroleum gas, butadiene, anhydrous ammonia, methylacetylene-propadiene, stabilized, or vinyl chloride.

(a) Tank cars used to transport liquefied petroleum gas, butadiene, anhydrous ammonia, methylacetylene-propadiene, stabilized, or vinyl chloride may as an alternate comply with the following special requirements:

(1) Safety relief valves may be set to the following pressures, provided the total valve discharge capacity is sufficient to prevent building up pressure in the tank in excess of 90 percent of the tank test pressure.

Safety relief valves, p.s.i.	DOT specifications		
	105A300W	112A340W, 114A340W	112A400W, 114A400W
Start-to-discharge pressure.....	247.5	280.5	330
Start-to-discharge tolerance.....	±7.5	±8.4	±10
Vapor tight pressure (minimum)...	196	224	264
Flow rating pressure.....	270	306	360

(b) Gaskets for manway covers and for mounting of fittings must be asbestos type or approved high-temperature resistant equivalent.

§ 179.102-12 Ethylene oxide.

Tank cars used to transport ethylene oxide must be registered and jackets stenciled DOT-105A100 or DOT-105A-100W and equipped with the safety relief valve required by such specifications. Tanks may have openings in the heads to facilitate nickel lining provided openings are closed in an approved manner. No copper or copper bearing alloys shall be used in any part of the tank or appurtenances if such part is normally in contact with ethylene oxide liquid or vapor. Tank jacket must be stenciled on both sides in letters not less than 1½ inches high "Ethylene Oxide Only".

§ 179.102-13 Hydrofluoric acid, anhydrous.

(a) Tank cars used to transport hydrofluoric acid, anhydrous, must comply with the following special requirements:

(1) Tanks must be equipped with valves and appurtenances approved for this particular service, made of metal not subject to rapid deterioration by the lading. For safety relief valves, see § 179.100-15(b) and (c).

(2) For specification DOT-114A400W tanks, valves and fittings must be located on the top of the tank.

(3) Bottom opening in tank prohibited.

§ 179.102-14 Acrolein inhibited.

Tank cars used to transport acrolein inhibited must be specification DOT-105A300W, or higher rated tanks registered and jackets stenciled DOT-105A-200W and must be equipped with the safety relief valve required by that specification. Jackets must be stenciled on both sides in letters not less than 1½ inches high "Acrolein Only".

§ 179.102-15 Sodium, metallic.

Tank cars used to transport metallic sodium must have exterior heater coils fusion welded to tank shell.

§ 179.102-16 Sulfur trioxide stabilized.

Tank cars used to transport sulfur trioxide stabilized must be equipped with safety relief valves of approved design. Tanks equipped with interior heating coils not permitted.

§ 179.102-17 Flammable liquids not specifically provided for.

Tank cars used to transport flammable liquids not specifically provided for may be equipped with openings in tank heads to facilitate application of lining provided openings are closed in an approved manner.

§ 179.102-20 Dimethyl hydrazine unsymmetrical.

Tank cars used to transport dimethyl hydrazine may have openings in the heads to facilitate nickel lining provided openings are closed in an approved manner. Class DOT-105AW tank cars used to transport dimethyl hydrazine unsymmetrical must be stenciled DOT-105A100W. Tanks must be equipped with steel or stainless steel safety relief valves of the type and size used on specification DOT-105A100W tank cars.

(J) In § 179.103-1, paragraph (f) would be added; in § 179.103-3 paragraphs (b) and (c) would be amended; § 179.103-4 would be amended; § 179.103-5 would be added to read as follows:

§ 179.103 Special requirements for class 114A * * * tank car tanks.

§ 179.103-1 Type.

(f) Class DOT-114 tank cars are uninsulated tank cars for the transportation of compressed gases as authorized in § 173.314 of this chapter.

§ 179.103-3 Venting, loading and unloading valves, measuring and sampling devices.

(b) These valves and appurtenances must be grouped in one location and, except as provided in § 179.103-5, must be equipped with a protective housing with cover, or may be recessed into tank shell with cover. An additional set grouped in another location may be provided. Protective housing with cover, when used, must have steel sidewalls not less than three-fourths inch in thickness and a metal cover not less than one-

fourth inch in thickness that can be securely closed. Underframe sills are an acceptable alternate to the protective housing cover, provided the arrangement is of approved design. For fittings recessed into tank shells, protective cover must be metal and not less than one-fourth inch in thickness.

(c) When tank car is used to transport liquefied flammable gasses, the interior pipes of the loading, unloading, and sampling valves must be equipped with excess flow valves of approved design except when quick closing internal valves of approved design are used. When the interior pipe of the gaging device provides a means for the passage of lading from the interior to the exterior of the tank, it must be equipped with an excess flow valve of approved design or with an orifice not exceeding a No. 54 drill size.

§ 179.103-4 Safety relief devices and pressure regulators.

(a) Safety relief devices and pressure regulators must be located on top of the tank near the center of the car on a nozzle, mounting plate or recess in the shell. Through or stud bolts, if used, must not enter the tank.

(b) Metal guard of approved design must be provided to protect safety relief devices and pressure regulators from damage.

§ 179.103-5 Bottom outlets.

(a) In addition to or in place of the venting, loading, and unloading valves, measuring and sampling devices as prescribed in § 179.103-3, tanks may be equipped with approved bottom outlet valves. If applied, bottom outlet valves must meet the following requirements:

(1) When external bottom outlet valve without interior pipes is used in liquefied flammable gas service, the valve opening must be closed with an internal bolted or self-energizing closure of approved design. Protective housing is not required. On cars with center sills, a ball valve may be welded to the outside bottom of the tank or mounted on a pad or nozzle with a tongue and groove or male and female flange attachment, but in no case shall the breakage groove or equivalent extend below the bottom flange of the center sill. On cars without continuous center sills, a ball valve may be welded to the outside bottom of the tank or mounted with a tongue and groove or male and female flange attachment on a pad attached to the outside bottom of the tank. The mounting pad must have a maximum thickness of 2½ inches measured on the longitudinal centerline of the tank. The valve operating mechanism must be provided with a suitable locking arrangement to insure positive closure during transit.

(2) When internal bottom outlet valve is used in liquefied flammable gas service, the outlet of the valve must be equipped with an excess flow valve of approved design, except when a quick-closing internal valve of approved design is used. Protective housing is not required.

(3) Bottom outlet valve must be equipped with a liquid tight closure at its lower end.

(b) Bottom outlet equipment must be of approved design and must meet the following requirements:

(1) On newly built empty cars with truck centers through 60 feet, 6 inches, the extreme projection of the bottom outlet equipment must be at least 12 inches above the top of rail on level track. On cars with truck centers greater than 60 feet, 6 inches, the minimum rail clearance must be in accordance with the graph in Appendix E of the AAR Specifications for Tank Cars. All bottom outlet reducers and closures and their attachments must be secured to car by at least ¾-inch chain or its equivalent, except that outlet closure plugs may be attached by ¼-inch chain. When the bottom outlet closure is of the combination cap and valve type, the pipe connection to the valve must be closed by a plug, cap, or approved quick-coupling device.

(2) Bottom outlet must be provided with a liquid tight closure at its lower end.

(3) The valve operating mechanism must be provided with a suitable locking arrangement to insure positive closure during transit.

(4) If outlet nozzle extends 6 inches or more from shell of tank, a breakage groove or its equivalent must be provided immediately below the lowest part of the valve. Breakage groove, if used, must consist of a "V" groove cut (not cast) in the nozzle to depth that will leave thickness of nozzle wall at the root of the "V" not over one-fourth inch. On cars without continuous center sills, the breakage groove or its equivalent must not be more than 15 inches below the tank shell. On cars with continuous center sills, the breakage groove or its equivalent must be above the bottom of the center sill construction.

(5) The valve body must be of a thickness which will insure that accidental breakage of the outlet nozzle will occur at or below the "V" groove, or its equivalent, and will not cause distortion of the valve seat or valve.

(K) The heading of § 179.104-1 would be amended to read as follows:

§ 179.104 Special requirements for spec. 105A200F tank car tanks.

§ 179.104-1 Tanks built under these specifications must meet the requirements of §§ 179.100, 179.101, and when applicable, §§ 179.102 and 179.104.

(L) In §§ 179.200 and 179.200-1, the headings would be amended; in § 179.200-3, paragraph (a) would be amended; in § 179.200-4 paragraph (a) would be amended; in § 179.200-6, paragraphs (a), (b), (c), (d), (e), and (f) would be amended, paragraph (g) would be added; § 179.200-7 would be amended, in § 179.200-8, paragraphs (a) and (b) would be amended, paragraph (c) would be canceled; in § 179.200-9, paragraph

(a) would be amended; in § 179.200-10 paragraph (b) would be added; § 179.200-11 would be amended; in § 179.200-13, the introductory text of paragraph (d) would be amended; in § 179.200-14, subparagraph (e) (3) would be amended; in § 179.200-15, paragraph (c) would be amended; in § 179.200-16, paragraphs (c) and (e) would be amended, paragraphs (f) and (g) would be added; in § 179.200-17, paragraphs (a) and (b) (1), (3), and (4) would be amended, paragraph (b) (5) would be redesignated (b) (6), a new paragraph (b) (5) would be added; in § 179.200-19, paragraph (b) would be added; in § 179.200-24, paragraph (b) would be added to read as follows:

§ 179.200 General specifications applicable to non-pressure tank car tanks (Classes DOT-103, 104, and 111).

§ 179.200-1 Tanks built under these specifications must meet the requirements of §§ 179.200, 179.201, and when applicable § 179.202.

§ 179.200-3 Type.

Tanks built under these specifications must be circular in cross section, with formed heads designed convex outward. When specified in § 179.201-1, the tank must have at least one manway or one expansion dome with manway, and such other external projections as are prescribed herein. When the tank is divided into compartments, each compartment must be treated as a separate tank.

§ 179.200-4 Insulation.

(a) If insulation is applied, the tank shell and expansion dome when used must be insulated with an approved material. The entire insulation must be covered with a metal jacket of a thickness not less than 11 gage (0.1196 inch) nominal (manufacturer's standard gage) and flashed around all openings so as to be weathertight. The exterior surface of a carbon steel tank and the inside surface of a carbon steel jacket must be given a protective coating, except that protective coating is not required when foam-in-place insulation that adheres to the tank or jacket is applied.

* * * * *

§ 179.200-6 Thickness of plates.

(a) The wall thickness after forming of the tank shell, dome shell, and of 2:1 ellipsoidal heads must be not less than specified in § 179.201-1, nor that calculated by the following formula:

$$t = \frac{Pd}{2SE}$$

where:

d = Inside diameter in inches;
 E = 0.9 welded joint efficiency; except $E=1.0$ for seamless heads;
 P = Minimum required bursting pressure in p.s.i.;
 S = Minimum tensile strength of plate material in p.s.i. as prescribed in § 179.200-7;
 t = Minimum thickness of plate in inches after forming.

(b) all

(b) The wall thickness after forming of 3:1 ellipsoidal heads must be not less than specified in § 179.201-1, nor that calculated by the following formula:

$$t = \frac{Pd}{2SE} \times 1.83$$

where:

d =Inside diameter in inches;
 E =0.9 welded joint efficiency; except
 $E=1.0$ for seamless heads;
 P =Minimum required bursting pressure in p.s.i.;
 S =Minimum tensile strength of plate material in p.s.i. as prescribed in § 179.200-7;
 t =Minimum thickness of plate in inches after forming.

(c) The wall thickness after forming of a flanged and dished head must be not less than specified in § 179.201-1, nor that calculated by the following formula:

$$t = \frac{5PL}{6SE}$$

where:

E =0.9 welded joint efficiency; except
 $E=1.0$ for seamless heads;
 L =Main inside radius to which head is dished, measured on concave side in inches;
 P =Minimum required bursting pressure in p.s.i.;
 S =Minimum tensile strength of plate material in p.s.i. as prescribed in § 179.200-7;
 t =Minimum thickness of plate in inches after forming.

(d) If plates are clad with material having tensile strength properties at least equal to the base plate, the cladding may be considered a part of the base plate when determining thickness. If cladding material does not have tensile strength at least equal to the base plate, the base plate alone must meet the thickness requirements.

(e) For a tank constructed of longitudinal sections, the minimum width of bottom sheet of the tank must be 60 inches measured on the arc, but in all cases the width must be sufficient to bring the entire width of the longitudinal welded joint, including welds, above the bolster.

(f) For a tank built of one-piece cylindrical sections, the thickness specified for bottom sheet must apply to the entire cylindrical section.

(g) See § 179.200-9 for thickness requirements for a compartmented tank.
§ 179.200-7 Materials.

(a) Plate material used to fabricate the tank and, when used, expansion dome or manway nozzle material, must meet one of the following specifications with the indicated minimum tensile strength and elongation in the welded condition.

(b) Carbon steel plate: The maximum allowable carbon content must be 0.31 percent when the individual specification allows carbon content greater than this amount. The plates may be clad with other approved materials:

Specifications	Minimum tensile strength (p.s.i.) welded condition ¹	Minimum elongation in 2 inches (percent) welded condition (longitudinal)
ASTM A 515-69, Gr. 55	55,000	28
ASTM A 515-69, Gr. 60	60,000	25
ASTM A 515-69, Gr. 65	65,000	20
ASTM A 515-69, Gr. 70	70,000	20
ASTM A 285-69, Gr. A	45,000	29
ASTM A 285-69, Gr. B	50,000	20
ASTM A 285-69, Gr. C	55,000	20
ASTM A 516-70, Gr. 55	55,000	28
ASTM A 516-70, Gr. 60	60,000	25
ASTM A 516-70, Gr. 65	65,000	20
ASTM A 516-70, Gr. 70	70,000	20
AAR TC128-70, Gr. A and B	81,000	19

¹ Maximum stresses to be used in calculations.

(c) Aluminum alloy plate: Aluminum alloy plate must be suitable for welding and comply with one of the following specifications:

Specifications	Minimum tensile strength (p.s.i.) 0 temper welded condition ¹	Minimum elongation in 2 inches (percent) 0 temper welded condition (longitudinal)
ASTM B 209-70, Alloy 5052	25,000	18
ASTM B 209-70, Alloy 5083	38,000	16
ASTM B 209-70, Alloy 5086	35,000	14
ASTM B 209-70, Alloy 5154	30,000	18
ASTM B 209-67, Alloy 5254	30,000	18
ASTM B 209-70, Alloy 5454	31,000	18
ASTM B 209-67, Alloy 5652	25,000	18
ASTM B 209-70, Alloy 6061	24,000	25

¹ For fabrication, the parent plate material may be 0, H112, or H32 temper, but design calculations must be based on minimum tensile strength shown.

² 0 temper only.

³ Weld filler metal 5556 must not be used.

⁴ Not authorized for tank shells, manways or domes.

⁵ T6 temper only.

⁶ Maximum stresses to be used in calculations.

(d) High alloy steel plate: ¹ High alloy steel plate must comply with one of the following specifications:

¹ High alloy steel materials used to fabricate tank and expansion dome, when used, must be tested in accordance with the following procedures in ASTM Specification A 262-68 titled, "Recommended Practices for Detecting Susceptibility to Intergranular Attack in Stainless Steels," and must exhibit corrosion rates not exceeding the following:

Test procedure	Material	Corrosion rate i.p.m.
Practice B	Types 304, 304L, 316, and 316L	0.0040
Practice C	Type 304L	0.0020
Practice C	Type 430A	0.0060

Type 304L and Type 316L test specimens must be given a sensitizing treatment prior to testing. (A typical sensitizing treatment is 1 hour at 125° F.)

Specification	Minimum tensile strength (p.s.i.) welded condition ¹	Minimum elongation in 2 inches (percent) welded condition (longitudinal)
ASTM A 240-70, Type 304	75,000	30
ASTM A 240-70, Type 304L	70,000	30
ASTM A 240-70, Type 316	75,000	30
ASTM A 240-70, Type 316L	70,000	30
ASTM A 240-70, Type 430A	65,000	22

¹ Maximum stresses to be used in calculations.

² High alloy steel materials used to fabricate tank and expansion dome, when used, must be tested in accordance with the following procedures in ASTM Specification A 262-68 titled, "Recommended Practices for Detecting Susceptibility to Intergranular Attack in Stainless Steels," and must exhibit corrosion rates not exceeding the following:

Test procedure	Material	Corrosion rate i.p.m.
Practice B	Types 304, 304L, 316, and 316L	0.0040
Practice C	Type 304L	0.0020
Practice C	Type 430A	0.0060

Type 304L and Type 316L test specimens must be given a sensitizing treatment prior to testing. (A typical sensitizing treatment is 1 hour at 125° F.)

(e) Nickel plate: ¹ Nickel plate must comply with the following specification:

Specification	Minimum tensile strength (p.s.i.) welded condition ¹	Minimum elongation in 2 inches (percent) welded condition (longitudinal)
ASTM B 162-69	40,000	20

¹ Maximum stresses to be used in calculations.

(f) Manganese-molybdenum steel plate: Manganese-molybdenum steel plate must be suitable for fusion welding and comply with the following specification:

Specifications	Minimum tensile strength (p.s.i.) welded condition ¹	Minimum elongation in 2 inches (percent) welded condition (longitudinal)
ASTM A 332-69a, Gr. B	80,000	20

¹ Maximum stresses to be used in calculations.

(g) All parts and items of construction in contact with the lading must be made of material compatible with plate material and not subject to rapid deterioration by the lading, or be coated or lined with suitable corrosion resistant material.

(h) All external projections which may be in contact with the lading and

¹ When used as cladding for carbon steel plate, low-carbon nickel is required.

all castings, forgings, or fabrications used for fittings or attachments to tank and expansion dome, when used, in contact with lading must be made of material to an approved specification. See AAR Specifications for Tank Cars, Appendix M, M4.05 for approved material specifications for castings for fittings.

§ 179.200-8 Tank heads.

(a) All external tank heads must be an ellipsoid of revolution in which the major axis must equal the diameter of the shell and the minor axis must be one-half the major axis.

(b) Internal compartment tank heads may be 2:1 ellipsoidal, 3:1 ellipsoidal, or flanged and dished to thicknesses as specified in § 179.200-6. Flanged and dished heads must have main inside radius not exceeding 10 feet, and inside knuckle radius must not be less than 3¾ inches for steel, alloy steel, or nickel tanks, and not less than 5 inches for aluminum alloy tanks.

(c) [Canceled]

§ 179.200-9 Compartment tanks.

(a) When a tank is divided into compartments, by inserting interior heads, interior heads must be inserted in accordance with AAR Specifications for Tank Cars, Appendix E, E7.00, and must comply with the requirements specified in § 179.201-1. Voids between compartment heads must be provided with at least one tapped drain hole at their lowest point, and a tapped hole at the top of the tank. Top hole must be closed, and the bottom hole may be closed, with not less than three-fourths of an inch nor more than 1½ inches solid pipe plugs having NPT threads.

§ 179.200-10 Welding.

(b) Welding is not permitted on or to ductile iron or malleable iron fittings.

§ 179.200-11 Postweld heat treatment.

After welding is complete, postweld heat treatment must be in compliance with the requirements of AAR Specifications for Tank Cars, Appendix W, when specified in § 179.201.1.

§ 179.200-13 Manway ring or flange, safety relief device flange, bottom outlet nozzle flange, bottom washout nozzle flange and other attachments and openings.

(d) Rivets, if used, must comply with AAR Specification M-110-64 or its equivalent, must be compatible with plate material, and must meet the following additional requirements:

§ 179.200-14 Expansion capacity.

(e) * * *

(3) The dome head, if dished, must be dished to a radius not exceeding 96 inches. Thickness of dished dome head must be calculated by the formula in § 179.200-6(c).

§ 179.200-15 Closures for manways.

(c) Manway covers must be of approved cast, forged or fabricated metals. Malleable iron, if used, must comply with ASTM A47-68, Grade 35018. Cast iron manway covers must not be used.

§ 179.200-16 Gaging devices, top loading and unloading devices, venting and air inlet devices.

(c) A tank may be equipped with a vacuum relief valve of an approved design. Protective housing is not required.

(e) Bottom of tank shell may be equipped with a sump or siphon bowl welded or pressed into the shell. Such sumps or siphon bowls, if applied, are not limited in size and must be made of cast, forged or fabricated metal. Each sump or siphon bowl must be of good welding quality in conjunction with the metal of the tank shell. When sump or siphon bowl is pressed in the bottom of the tank shell, the wall thickness of the pressed section must not be less than that specified for the shell. The section of a circular cross section tank to which a sump or siphon bowl is attached need not comply with the out-of-roundness requirement specified in Appendix W, W14.06, of the AAR Specifications for Tank Cars. Any portion of a sump or siphon bowl not forming a part of a cylinder of revolution must have walls of such thickness and be so reinforced that the stresses in the walls caused by a given internal pressure are not greater than the circumferential stress which would exist under the same internal pressure in the wall of a tank of circular cross section designed in accordance with § 179.200-6 (a) and (d). In no case shall the wall thickness be less than that specified in § 179.201-1(a).

(f) When top loading and discharge devices, or venting and air inlet devices are installed with exposed piping to a removed location, shut-off valves must be applied directly to reinforcing pads or nozzles at their communication through the tank shell, and must be enclosed in a protective housing with provision for a seal. The piping must include breakage grooves, and suitable bracing. Relief valves must be applied to liquid lines for protection in case lading is trapped. Provision must be made to insure closure of the valves while the car is in transit.

(g) Protective housing, when required, must be fabricated of approved material and have cover and sidewalls not less than 0.119 inch in thickness.

§ 179.200-17 Bottom outlets.

(a) If indicated in § 179.201-1, tank may be equipped with bottom outlet. Bottom outlet, if applied, must comply with the following requirements:

(1) On newly built empty cars with truck centers through 60 feet, 6 inches, the extreme projection of the bottom outlet equipment must be at least 12 inches above the top of rail on level track. On cars with truck centers greater than 60

feet, 6 inches, the minimum rail clearance must be in accordance with the graph in Appendix E of the AAR Specifications for Tank Cars. All bottom outlet reducers and closures and their attachments must be secured to car by at least ¾-inch chain or its equivalent, except that outlet closure plugs may be attached by ¼-inch chain. When the bottom outlet closure is of the combination cap and valve type, the pipe connection to the valve must be closed by a plug, cap, or approved quick coupling device.

(2) Bottom outlet must be of approved construction, and be provided with a liquid-tight closure at its lower end.

(3) On cars with center sills, a ball valve may be welded to the outside bottom of the tank or mounted on a pad or nozzle with a tongue and groove or male and female flange attachment. In no case shall the breakage groove or equivalent extend below the bottom flange of the center sill. On cars without continuous center sills, a ball valve may be welded to the outside bottom of the tank or mounted with a tongue and groove or male and female flange attachment on a pad attached to the outside bottom of the tank. The mounting pad must have a maximum thickness of 2½ inches measured on the longitudinal centerline of the tank. The valve operating mechanism must be provided with a suitable locking arrangement to insure positive closure during transit.

(4) The valve operating mechanism for valves applied to the interior of the tank, and outlet nozzle construction must insure against the unseating of the valve due to stresses or shocks incident to transportation.

(5) Bottom outlet nozzle of interior valves and the valve body of exterior valves, must be of cast, fabricated or forged metal. If welded to tank, they must be of good weldable quality in conjunction with metal of tank.

(6) To provide for the attachment of unloading connections, the bottom of the main portion of the outlet nozzle or valve body of exterior valves, or some fixed attachment thereto, must be provided with threaded cap closure arrangement or bolted flange closure arrangement having minimum 1 inch threaded pipe plug or approved quick-coupling device. When two-piece quick-coupling devices (i.e., adapter and dust cap) are used on bottom outlet extensions, an inline auxiliary valve must be applied between the bottom outlet valve and the quick-coupling closure. The quick-coupling closure (dust cap) or outlet nozzle wall must be fitted with a minimum 1-inch threaded plug. The auxiliary valve and dust cap may be omitted when the quick-coupling adapter is threaded internally and fitted with a minimum 1-inch plug.

(7) If outlet nozzle extends 6 inches or more from shell of tank, a "V" groove must be cut (not cast) in the upper part of outlet nozzle at a point immediately below lowest part of valve to a depth that will leave thickness of nozzle wall at the root of the "V" not over one-fourth inch. The outlet nozzle on in-

(b) all exterior valves or the valve body on exterior valves may be steam jacketed, in which case the breakage groove or its equivalent must be below the steam chamber but above the bottom of center sill construction. If outlet nozzle is not a single piece, or if exterior valves are applied, provision must be made for the equivalent of the breakage groove. On cars without continuous center sills, the breakage groove or its equivalent must be not more than 15 inches below the tank shell. On cars with continuous center sills the breakage groove or its equivalent must be above the bottom of the center sill construction.

(8) The flange on the outlet nozzle or the valve body of exterior valves must be of a thickness which will prevent distortion of the valve seat or valve by any change in contour of the shell resulting from expansion of lading, or other causes, and which will insure that accidental breakage of the outlet nozzle will occur at or below the "V" groove, or its equivalent.

(9) The valve must have no wings or stem projecting below the "V" groove or its equivalent. The valve and seat must be readily accessible or removable for repairs, including grinding.

(10) The valve operating mechanism on interior valves must have means for compensating for variation in the vertical diameter of the tank produced by expansion, weight of the liquid contents, or other causes, and may operate from the interior of the tank, but in the event the rod is carried through the dome, or tank shell, leakage must be prevented by packing in stuffing box or other suitable seals and a cap.

(b) * * *

(1) On newly built empty cars with truck centers through 60 feet, 6 inches, the extreme projection of the bottom washout equipment must be at least 12 inches above the top of rail on level track. On cars with truck centers greater than 60 feet, 6 inches, the minimum rail clearance must be in accordance with the graph in Appendix E of the AAR Specifications for Tank Cars.

(3) If washout nozzle extends 6 inches or more from shell of tank, a "V" groove must be cut (not cast) in the upper part of the nozzle at a point immediately below the lowest part of inside closure seat or plug to a depth that will leave wall thickness of nozzle at the root of the "V" not over one-fourth inch. Where nozzle is not a single piece, provision must be made for the equivalent of the breakage groove. The nozzle must be of a thickness to insure that accidental breakage will occur at or below the "V" groove or its equivalent. On cars without continuous center sills, the breakage groove or its equivalent must not be more than 15 inches below the tank shell. On cars with continuous center sills the breakage groove or its equivalent must be above the bottom of the center sill construction.

(4) The closure plug and seat must be readily accessible or removable for repairs, including grinding.

(5) The closure of the washout nozzle must be equipped with a 3/4-inch solid screw plug. Plug must be attached by at least a 1/4-inch chain.

(6) Joints between closures and their seats may be gasketed with suitable material.

§ 179.200-19 Reinforcements, when used, and appurtenances not otherwise specified.

(b) Reinforcing pads must be used between external brackets and shells if the attachment welds exceed 6 lineal inches of 1/4-inch fillet or equivalent weld per bracket or bracket leg. When reinforcing pads are used, they must not be less than one-fourth inch in thickness, have each corner rounded to a 1-inch minimum radius, and be attached to the tank by continuous fillet welds except for venting provisions. The ultimate shear strength of the bracket to reinforcing pad weld must not exceed 85 percent of the ultimate shear strength of the reinforcing pad to tank weld.

§ 179.200-24 Stamping.

(b) On Class DOT-111 tank cars, the last numeral of the specification number may be omitted from the stamping; for example, DOT-111A100W.

(M) In § 179.201-1 paragraph (a), the entire table would be amended; in § 179.201-2 paragraph (a), the sentence preceding the table would be amended; in § 179.201-3, paragraphs (a), (b), and (c) would be amended; (d), (e), (f), and (g) would be added; § 179.201-4 would be amended; §§ 179.201-5 and 179.201-6 would be amended; in § 179.201-7, paragraph (a) would be amended; § 179.201-9 would be amended to read as follows:

§ 179.201 Individual specification requirements applicable to nonpressure tank car tanks.

§ 179.201-1 Individual specifications requirements.

(a) * * *

DOT specifications	103A-ALW	103AW	103ALW	103ANW	103BW	103CW	103DW	103EW
Material (see 179.200-7)	Al alloy	Steel	Al alloy	Nickel	Steel	Alloy steel	Alloy steel	Alloy steel
Insulation (see 179.200-4)	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional
Bursting pressure p.s.i. (See 179.200-5)	240	240	240	240	240	240	240	240
Minimum Plate thickness inches								
Shell (see 179.200-6)	3/2	179.201-2	3/2	179.201-2	179.201-2	179.201-2	179.201-2	179.201-2
Heads (see 179.200-6) and 179.200-8)	3/2	179.201-2	3/2	179.201-2	179.201-2	179.201-2	179.201-2	179.201-2
Dome	Required	Required	Required	Required	Required	Required	Required	Required
Minimum expansion capacity (see 179.200-14)	1 percent in dome	1 percent in dome	2 percent in dome	1 percent in dome	1 percent in dome	1 percent in dome	2 percent in dome	1 percent in dome
Test pressure p.s.i. (see 179.200-22)	60	60	60	60	60	60	60	60
Safety relief devices (see 179.200-18)	Valve or vent	179.201-7	Valve or vent	179.201-7	Vent	Valve	Valve or vent	Valve or vent
Valve start-to-discharge pressure p.s.i. (±3 p.s.i.)	35	35	35	35		35	35	35
Valve vapor tight pressure (minimum p.s.i.)	28	28	28	28		28	28	28
Valve flow rating pressure (maximum p.s.i.)	45	45	45	45		45	45	45
Vent bursting pressure (maximum p.s.i.)	45	45	45	45	45	45	45	45
Gaging devices (see 179.200-16)	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional
Top loading and unloading devices (see 179.200-16)	Required	Required	Optional	Required	Required	Required	Optional	Required
	(valves optional)	(valves optional)		(valves optional)	(valves optional)	(valves optional)		(valves optional)
Bottom outlet (see 179.200-17(a))	Prohibited	Prohibited	Optional	Prohibited	Prohibited	Prohibited	Optional	Prohibited
Bottom washout (see 179.200-17(b))	Optional	Optional	Optional	Optional	Prohibited	Prohibited	Optional	Optional
Closure for manway (see 179.200-15)			179.201-6(a)	179.201-6(d)	179.201-6(b)	179.201-6(c)	179.201-6(a)	179.201-6(c)
							179.201-6(c)	
Postweld heat treatment (HT) (see 179.200-11)	Prohibited	HT	Prohibited	Not required	HT	HT 179.201-5	HT 179.201-5	HT 179.201-5
Special references	179.202-10	179.202-7	179.202-1	179.202-8	179.201-3	179.201-4	179.201-4	179.201-4
	179.202-15	179.202-8	179.202-21	179.202-11	179.202-9	179.202-14	179.202-1	179.202-11
	179.202-21	179.202-11		179.202-17		179.202-19		179.202-15
		179.202-12				179.202-21		
		179.202-13						
		179.202-16						
		179.202-17						

DOT specifications	103W	104W	111A60ALW1	111A60ALW2	111A60W1 ¹	111A60W2	111A60W5	111A60W7
Material (see 179.200-7)	Steel	Steel	Al alloy	Al alloy	Steel	Steel	Steel	Alloy steel
Insulation (see 179.200-4)	Optional	Required	Optional	Optional	Optional	Optional	Optional	Optional
Bursting pressure p.s.i. (see 179.200-5)	240	240	240	240	240	240	240	240
Minimum plate thickness inches:								
Shell (see 179.200-6)	179.201-2	179.201-2	1/2	1/2	3/16	3/16	3/16	3/16
Heads (see 179.200-6 and 179.200-8)	179.201-2	179.201-2	1/2	1/2	3/16	3/16	3/16	3/16
Dome	Required	Required	None	None	None	None	None	None
Minimum expansion capacity (see 179.200-14)	2 percent in dome	2 percent in dome	2 percent in tank	1 percent in tank	2 percent in tank	1 percent in tank	1 percent in tank	1 percent in tank
Test pressure p.s.i. (see 179.200-22)	60	60	60	60	60	60	60	60
Safety relief devices (see 179.200-18)	Valve or vent	Valve or vent	Valve or vent	Valve or vent	Valve or vent	179.201-7	Vent	Valve or vent
Valve start-to-discharge pressure p.s.i. (±3 p.s.i.)	35	35	35	35	35	35	35	35
Valve vapor tight pressure (minimum p.s.i.)	28	28	28	28	28	28	28	28
Valve flow rating pressure (maximum p.s.i.)	45	45	45	45	45	45	45	45
Vent bursting pressure (maximum p.s.i.)	45	45	45	45	45	45	45	45
Gaging devices (see 179.200-16)	Optional	Optional	Required	Required	Required	Required	Required	Optional
Top loading and unloading devices (see 179.200-16)	Optional	Optional	Optional	Required (valves optional)	Optional	Required (valves optional)	Required (valves optional)	Required (valves optional)
Bottom outlet (see 179.200-17(a))	Optional	Optional	Optional	Prohibited	Optional	Prohibited	Prohibited	Prohibited
Bottom washout (see 179.200-17(b))	Optional	Optional	Optional	Optional	Optional	Optional	Prohibited	Prohibited
Closure for manway (see 179.200-15)	179.201-6(a)	179.201-6(a)	179.201-6(a)	179.201-6(a)	179.201-6(a)	179.201-6(a)	179.201-6(b)	179.201-6(c)
Postweld heat treatment (HT) (see 179.200-11)	HT	HT	Prohibited	Prohibited	HT	HT	HT	HT 179.201-5
Special references	179.202-1 179.202-2 179.202-3 179.202-4 179.202-5 179.202-6 179.202-19	179.202-1	179.202-1	179.202-1 179.202-15 179.202-21	179.202-2 179.202-3 179.202-5 179.202-6		179.201-3	179.201-4 179.202-21

DOT specifications	111A100ALW1	111A100ALW2	111A100W1 ¹	111A100W2 ¹	111A100W3	111A100W4	111A100W5	111A100W6	111A60F1, ¹ 111A100F1, ¹ 111A100F2, ¹
Material (see 179.200-7)	Al alloy	Al alloy	Steel	Steel	Steel	Steel	Steel	Alloy steel	
Insulation (see 179.200-4)	Optional	Optional	Optional	Optional	Required	Required (179.201-11)	Optional	Optional	
Bursting pressure p.s.i. (see 179.200-5)	500	500	500	500	500	500	500	500	
Minimum plate thickness inches:									
Shell (see 179.200-6)	5/8	5/8	3/4	3/4	3/4	3/4	3/4	3/4	
Heads (see 179.200-6 and 179.200-8)	5/8	5/8	3/4	3/4	3/4	3/4	3/4	3/4	
Dome	None	None	None	None	None	None	None	None	
Minimum expansion capacity (see 179.200-14)	2 percent in tank	1 percent in tank	2 percent in tank	1 percent in tank	2 percent in tank	173.314(c)	1 percent in tank	2 percent in tank	
Test pressure p.s.i. (see 179.200-22)	100	100	100	100	100	100	100	100	
Safety relief devices (see 179.200-18)	Valve or vent	Valve or vent	Valve or vent	179.201-7	Valve or vent	Valve	Vent	Valve or vent	
Valve start-to-discharge pressure p.s.i. (±3 p.s.i.)	75	75	75	75	75	75	75	75	
Valve vapor tight pressure (minimum p.s.i.)	60	60	60	60	60	60	60	60	
Valve flow rating pressure (maximum p.s.i.)	85	85	85	85	85	85	85	85	
Vent bursting pressure (maximum p.s.i.)	75	75	75	75	75	75	75	75	
Gaging devices (see 179.200-16)	Required	Required	Required	Required	Required	Required (179.201-9)	Required	Required	
Top loading and unloading devices (see 179.200-16)	Optional	Required (valves optional)	Optional	Required (valves optional)	Optional (if used, valves required)	Required (valves required)	Required (valves optional)	Optional (if used, valves required)	
Bottom outlet (see 179.200-17(a))	Optional	Prohibited	Optional	Prohibited	Optional	Prohibited	Prohibited	Optional	
Bottom washout (see 179.200-17(b))	Optional	Optional	Optional	Optional	Optional	Prohibited	Prohibited	Optional	
Closure for manway (see 179.200-15)	179.201-6(a)		179.201-6(a)		179.201-6(a)	179.201-6(a)	179.201-6(b)	179.201-6(a), 179.201-6(c)	
Postweld heat treatment (HT) (see 179.200-11)	Prohibited	Prohibited	HT	HT	HT	HT	HT	HT 179.201-5	
Special references		179.202-21	179.202-1 179.202-2 179.202-6	179.202-7 179.202-8 179.202-11 179.202-12 179.202-13 179.202-16 179.202-17 179.202-20 179.202-22	179.202-1	179.201-8 179.201-10 179.202-1 179.202-18	179.201-3 179.202-9	179.201-4 179.202-1 179.202-14	

¹Tanks converted to DOT-111A series from existing forge-welded specification. DOT-105A300, 400, or 500 tanks, by modification using conversion details complying

with DOT-111A specification requirements, shall be stenciled by substituting the letter "F" for the letter "W" in the specification designation.

§ 179.201-2 Minimum plate thickness.

(a) The minimum plate thickness after forming must be as follows:

§ 179.201-3 Lined tanks.

(a) Rubber-lined tanks:

(1) Each tank or each compartment thereof must be lined with acid-resistant rubber or other approved rubber com-

pound vulcanized or bonded directly to the metal tank, to provide a nonporous laminated lining, at least 5/32-inch thick, except overall rivets and seams formed by riveted attachments the lining must be double thickness. The rubber lining must overlap at least 1 1/2 inches at all edges which must be straight and be beveled to an angle of approximately 45°, or butted edges of lining must be sealed

with a 3-inch minimum strip of lining having 45° beveled edges.

(2) As an alternate method, the lining may be joined with a skived butt seam then capped with a separate strip of lining 3 inches wide having 45° beveled edges. An additional rubber reinforcing pad at least 4 1/2 feet square and at least 1/2-inch thick must be applied by vulcanizing to the lining on bottom of tank

directly under the manway opening. The edges of the rubber pad must be beveled to an angle of approximately 45°. An opening in this pad for sump is permitted. No lining must be under tension when applied except due to conformtaion over rivet heads. Interior of tank must be free from scale, oxidation, moisture, and all foreign matter during the lining operation.

(3) Other approved lining materials may be used provided the material is resistant to the corrosive or solvent action of the lading in the liquid or gas phase and is suitable for the service temperatures.

(b) Before a tank car tank is lined with rubber, or other rubber compound, a report certifying that the tank and its equipment have been brought into compliance with specification DOT-103B, 103W, 111A60W5 or 111A100W5 must be furnished by car owner to the party who is to apply the lining. A copy of this report in approved form, certifying that tank has been lined in compliance with all requirements of one of the above specifications, must be furnished by party lining tank to car owner. Reports of the latest lining application must be retained by the car owner until the next relining has been accomplished and recorded.

(c) All rivet heads on inside of tank must be buttonhead, or similar shape, and of uniform size. The under surface of heads must be driven tight against the plate. All plates, castings and rivet heads on the inside of the tank must be calked. All projecting edges of plates, castings and rivet heads on the inside of the tank must be rounded and free from fins and other irregular projections. Castings must be free from porosity.

(d) All surfaces of attachments or fittings and their closures exposed to the lading must be covered with at least 1/8-inch acid-resistant material. Attachments made of metal not affected by the lading need not be covered with rubber or other acid resistant material.

(e) Hard rubber or polyvinyl chloride may be used for pressure retaining parts of safety vents provided the material is resistant to the corrosive or solvent action of the lading in the liquid or gas phase and is suitable for the service temperatures.

(f) Polyvinyl chloride lined tanks. Tank car tanks or each compartment thereof may be lined with elastomeric polyvinyl chloride having a minimum lining thickness of three-thirty-seconds of an inch.

(g) Polyurethane lined tanks. Tank car tanks or each compartment thereof may be lined with elastomeric polyurethane having a minimum lining thickness of one-sixteenth of an inch.

§ 179.201-4 Material.

All fittings, tubes and castings and all projections and their closures, except for protective housing, must also meet the requirements specified in AAR Specifications for Tank Cars, Appendix M, M3.03(b) and M4.05(d).

§ 179.201-5 Postweld heat treatment and corrosion resistance.

(a) Tanks and attachments welded directly thereto must be postweld heat treated as a unit at the proper temperature except as indicated below. Tanks and attachments welded directly thereto fabricated from ASTM A240-70 Type 430A, Type 304, and Type 316 materials must be postweld heat treated as a unit and must be tested to demonstrate that they possess the corrosion resistance specified in AAR Specifications for Tank Cars, Appendix M, M3.03(b). Tanks and attachments welded directly thereto, fabricated from ASTM A240-70 Type 304L or Type 316L materials are not required to be postweld heat treated.

(b) Tanks and attachments welded directly thereto, fabricated from ASTM A240-70 Type 304L and Type 316L materials must be tested to demonstrate that they possess the corrosion resistance specified in AAR Specifications for Tank Cars, Appendix M, M3.03(b).

§ 179.201-6 Manways and manway closures.

(a) The manway cover for specification DOT 103ALW, 103DW, 103W, 104W, 111A60ALW1, 111A60W1, 111A100ALW1, 111A100W1, 111A100W3, or 111A100W6 must be designed to make it impossible to remove the cover while the interior of the tank is subjected to pressure.

(b) The manway cover for specification DOT 103EW, 111A60W5, or 111A100W5 must be made of a suitable metal. The top, bottom and edge of manway cover must be acid resistant material covered as prescribed in § 179.201-3. Through bolt holes must be lined with acid resistant material at least 1/8-inch in thickness. Cover made of metal not affected by the lading need not be acid resistant material covered.

(c) The manway ring and cover for specification DOT-103CW, 103DW, 103EW, 111A60W7 or 111A100W6 must be made of the metal specified in AAR Specifications for Tank Cars, Appendix M, M3.03(b).

(d) The manway ring for DOT 103ANW must be made of cast, forged or fabricated nickel and be a good weldable quality in conjunction with the metal of the dome. Manway cover must be made of nickel.

§ 179.201-7 Safety relief devices.

(a) Each tank or compartment must be equipped with a safety vent unless characteristics of the lading require a safety relief valve. These devices must comply with § 179.200-18.

§ 179.201-9 Gaging device.

A gaging device of an approved design must be applied to permit determining the liquid level of the lading. The gaging device must be made of materials not subject to rapid deterioration by the lading. When the interior pipe of the gaging device provides a means for passage of the lading from the interior to the exterior of the tank,

it must be equipped with an excess flow valve of an approved design. The gaging device must be provided with a protective housing.

(N) In §§ 179.202-1, 179.202-2, and 179.202-3, paragraph (a) would be amended; in § 179.202-4, paragraph (a) would be amended by deleting "Specification 103-W" at the beginning of the paragraph; in §§ 179.202-5, 179.202-6, 179.202-7, and 179.202-8, paragraph (a) would be amended; in § 179.202-9, the Heading and paragraph (a) would be amended, paragraph (b) would be added; in § 179.202-10, paragraph (a) would be amended; § 179.202-11 would be amended; in § 179.202-12, paragraph (a) would be amended, paragraph (b) would be added; in § 179.202-13, paragraph (a) would be amended; in § 179.202-14, paragraphs (a) and (b) would be amended, paragraph (c) would be canceled; in §§ 179.202-15, 179.202-16, 179.202-17, 179.202-18, and 179.202-19, paragraph (a) would be amended; §§ 179.202-20, 179.202-21, and 179.202-22 would be added to read as follows:

§ 179.202 Special commodity requirements for non-pressure tank car tanks.

§ 179.202-1 Flammable liquids not specifically provided for.

Tank cars used to transport flammable liquids not specifically provided for must have manway closures so designed that pressure will be released automatically by starting the operation of removing the manway cover. Openings in tank heads to facilitate application of lining are authorized and must be closed in an approved manner. Specifications ARA-III, ARA-IV and ICC-103, DOT-103W, 103ALW, 104, 104W, 111A60ALW1 or 111A100W3, used to transport flammable liquids not specifically provided for, having a vapor pressure exceeding 27 pounds per square inch absolute at 100° F. but not exceeding 40 p.s.i.a. at 100° F., must have their manway closures equipped with approved safeguards making removal of closures from the manway opening practically impossible while car interior is subjected to vapor pressure of lading. These cars must be stenciled on each side of dome in line with the ladders, and in a color contrasting to the color of the dome with the identification mark as prescribed in AAR Specifications for Tank Cars, Appendix C.

§ 179.202-2 Dimethyl dichlorosilane, ethyl dichlorosilane, ethyl trichlorosilane, methyl trichlorosilane, trimethyl chlorosilane, vinyl trichlorosilane, methyl dichlorosilane and trichlorosilane.

Tank cars used to transport dimethyl dichlorosilane, ethyl dichlorosilane, ethyl trichlorosilane, methyl trichlorosilane, trimethyl chlorosilane, vinyl trichlorosilane, methyl dichlorosilane, and Trichlorosilane, must be equipped with bottom discharge outlet.

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§ 179.202-3 Amyl mercaptan, Butyl mercaptan, Ethyl mercaptan, Isopropyl mercaptan, Propyl mercaptan, and Aliphatic mercaptan mixtures.

Tank cars used to transport amyl mercaptan, butyl mercaptan, ethyl mercaptan, isopropyl mercaptan, propyl mercaptan, and aliphatic mercaptan mixtures must have bottom outlets effectively sealed. Bottom washout permitted.

§ 179.202-5 Phosphorus, white or yellow.

Tank cars used to transport phosphorus, white or yellow, must be equipped with approved dome fittings, external heater systems and with insulation at least 4 inches in thickness, except that thickness of insulation may be reduced to 2 inches over external heater coils. Bottom washout nozzle of approved design may be applied. Bottom outlet for discharge of lading prohibited.

§ 179.202-6 Cumene hydroperoxide, Diisopropylbenzene hydroperoxide and Paramenthane hydroperoxide.

Tank cars used to transport cumene hydroperoxide of strength not exceeding 90 percent in a nonvolatile solvent. Paramenthane hydroperoxide of strength not exceeding 60 percent in a nonvolatile solvent and diisopropylbenzene hydroperoxide of strength not exceeding 60 percent in a nonvolatile solvent, must have bottom outlets effectively sealed from the inside.

§ 179.202-7 Titanium tetrachloride, anhydrous.

Tank cars used to transport titanium tetrachloride, anhydrous, must be equipped with safety relief valves. Safety vents not permitted.

§ 179.202-8 Chloroacetyl chloride.

Tank cars used to transport chloroacetyl chloride must have a nickel cladding of $\frac{1}{16}$ -inch minimum thickness. Nickel cladding in tanks must have a minimum nickel content of at least 99 percent pure nickel. Specification DOT-103ANW tank cars used to transport chloroacetyl chloride must be of solid nickel at least 99 percent pure and all cast metal parts of the tank in contact with the lading must have a minimum nickel content of 96.7 percent.

§ 179.202-9 Hydrochloric (muriatic) acid, hydrochloric (muriatic) acid mixtures, hydrochloric (muriatic) acid solution, inhibited; sodium chlorite solution (not exceeding 42 percent sodium chlorite), and cleaning compounds, liquid, containing hydrochloric (muriatic) acid.

(a) For acids not over 38 percent strength by weight, except hydrochloric (muriatic) acid of not over 22° Baume strength, tank cars may be equipped with safety vent of approved design having a frangible disc with $\frac{1}{8}$ -inch breather hole in the center, or a safety vent of approved design using carbon discs permitting continuous venting.

(b) Sodium chlorite solution: Specification DOT-103CW tank cars having tanks of Type 304L stainless steel authorized for sodium chlorite solution not exceed 42 percent sodium chlorite only.

§ 179.202-10 Hydrogen peroxide solution in water exceeding 52 percent by weight.

Tank cars used to transport hydrogen peroxide solution in water exceeding 52 percent by weight, must be equipped with a venting arrangement approved by the Bureau of Explosives.

§ 179.202-11 Phosphorus oxybromide, phosphorus oxychloride, phosphorus trichloride, and thiophosphoryl chloride.

Specification DOT-103ANW tank cars used to transport phosphorus oxybromide, phosphorus oxychloride, phosphorus trichloride, and thiophosphoryl chloride must be solid nickel at least 99 percent pure and all cast metal parts of the tank in contact with the lading have a minimum nickel content of approximately 96.7 percent. Specification DOT-103A tank cars used to transport phosphorus trichloride must be lead-lined steel, or made of steel at least 10 percent nickel clad. Specification DOT-103AW, 111A100F2, or 111A100W2 tank cars used to transport phosphorus trichloride must be lead-lined steel or made of steel with a minimum thickness of nickel cladding of one-sixteenth inch. Nickel cladding in tanks must have a minimum nickel content of at least 99 percent pure nickel. Specification DOT-103EW tank cars used to transport phosphorus trichloride and thiophosphoryl chloride must have tanks fabricated from Type 316 stainless steel. Unlined specification DOT-103A, 103AW, 111A100F2, or 111A100W2 tank cars authorized for phosphorus trichloride only.

§ 179.202-12 Sulfuric acid of concentrations 65.25 percent (approximately 1.559 specific gravity) (52° Baume) or greater.

(a) Specification DOT-103A, 103AW, 111A100F2, or 111A100W2 tank cars used for this service may be equipped with safety vent of approved design having a frangible disc with $\frac{1}{8}$ -inch breather hole in the center.

(b) Specification DOT-103A, 103AW, 111A100F2, or 111A100W2 tank cars used in oleum and other fuming acids must be equipped with safety vent of approved design. Breather hole in frangible disc prohibited. Safety valve prohibited.

§ 179.202-13 Sulfur trioxide, stabilized.

Tank cars used to transport sulfur trioxide stabilized must be equipped with safety relief valves of approved design. Tanks equipped with interior heating coils not permitted.

§ 179.202-14 Anhydrous hydrazine and hydrazine solutions containing 50 percent or less of water.

(a) Tank cars used to transport anhydrous hydrazine or hydrazine solutions containing 50 percent or less water, must have tanks fabricated of Type 304L

stainless steel with molybdenum content not exceeding one-half of 1 percent. Specification DOT-111A100W6 tanks must not be equipped with bottom outlet.

(b) Safety relief valves for specifications DOT-103A-ALW and 103CW tank cars used to transport anhydrous hydrazine may have a start-to-discharge pressure of 45 p.s.i. with a tolerance of plus or minus 3 p.s.i. and a vapor tight pressure of 36 p.s.i. Refer to AAR Specifications for Tank Cars Appendix A, A8.05.

(c) [Canceled]

§ 179.202-15 Formic acid and Formic acid solutions.

Tank cars used to transport formic acid and formic acid solutions must be stenciled "Formic Acid Only". Specification DOT-103EW tank car tanks must be fabricated from Type 316 stainless steel.

§ 179.202-16 Monochloroacetic acid, liquid.

Tank cars used to transport monochloroacetic acid, liquid, must have tanks nickel clad at least 20 percent.

§ 179.202-17 Benzyl chloride.

Tank cars used to transport benzyl chloride, stabilized, must be 10 percent nickel clad. Specification DOT-103ANW tank cars used to transport benzyl chloride must have all cast metal parts in contact with the lading made from metal having a minimum nickel content of 96.7 percent.

§ 179.202-18 Ethylene oxide.

Specifications ARA-IVA and DOT-111A100W4 tank cars used to transport ethylene oxide may have openings in the heads to facilitate nickel lining provided openings are closed in an approved manner. No copper or copper bearing alloys must be used in any part of the tank or appurtenances if such part is normally in contact with ethylene oxide liquid or vapor. Tank jacket must be stenciled on both sides in letters not less than $1\frac{1}{2}$ inches high "Ethylene Oxide Only".

§ 179.202-19 Dimethylhydrazine, unsymmetrical.

Tank cars used to transport dimethylhydrazine, unsymmetrical, must be equipped with steel safety valves of approved design. Specification DOT-103W tank cars must not be equipped with bottom outlets.

§ 179.202-20 Hydrofluoric acid.

Breather hole in frangible disc prohibited.

§ 179.202-21 Nitric acid.

(a) Tank cars used to transport nitric acid must comply with the following requirements.

(1) Bottom washout or bottom outlet is prohibited unless effectively sealed with an approved arrangement to prevent use during loading and unloading of acid.

(2) Safety vent is prohibited.

(b) 179.202-22 Mixed acid (nitric and sulfuric acid) (nitrating acid).

Specifications DOT-103A, 103AW, 111A100F1, or 111A100W2 tank cars used in nitrating and other fuming acids service must be equipped with safety vent of approved design. Breather hole in frangible disc prohibited. Safety valve prohibited.

(O) In § 179.300, the heading would be amended; in § 179.300-6, the text in paragraph (a) preceding the formula and line "t" of the formula's explanation would be amended; § 179.300-7 would be amended; in § 179.300-8, paragraph (b) would be amended; in § 179.300-9, paragraphs (a) and (b) would be amended; § 179.300-10 would be amended; in § 179.300-14, paragraph (a) would be amended; in § 179.300-16, the first sentence of paragraph (a) would be amended by substituting "postweld heat treatment" for "stress relieving" in the first line; in § 179.300-17, paragraph (b) would be amended; in § 179.300-20, paragraph (b) would be amended to read as follows:

§ 179.300 General specifications applicable to multiunit tank car tanks designed to be removed from car structure for filling and emptying. (Classes DOT-103, 104, and 111.)

§ 179.300-6 Thickness of plates.

(a) For class DOT-110A tanks the wall thickness after forming of the cylindrical portion of the tank must not be less than that specified in § 179.301 or that calculated by the following formula:

$$t = \text{Minimum thickness of plate material in inches after forming.}$$

§ 179.300-7 Materials.

(a) Carbon steel plate material used to fabricate tanks having heads fusion welded to tank shell must comply with the following specifications with the indicated minimum tensile strength and elongation in the welded condition. The maximum allowable carbon content must be 0.31 percent when the individual specification allows carbon content greater than this amount. The plates may be clad with other approved materials.

Specifications	Minimum tensile strength (p.s.i.) welded condition ¹	Minimum elongation in 2 inches (percent) welded condition (longitudinal)
ASTM A 285-69 Gr. A	45,000	29
ASTM A 285-69 Gr. B	50,000	20
ASTM A 285-69 Gr. C	55,000	20
ASTM A 515-69 Gr. 65	65,000	20
ASTM A 515-69 Gr. 70	70,000	20

¹ Maximum stresses to be used in calculations.

(b) Carbon steel plate material used to fabricate tanks with forge welded heads must comply with the following specifications:

Specifications	Minimum tensile strength (p.s.i.) welded condition ¹	Minimum elongation in 2 inches (percent) welded condition (longitudinal)
ASTM A 285-69 Gr. A	45,000	29

¹ Maximum stresses to be used in calculations.

(c) All plates must have their heat number and the name or brand of the manufacturer legibly stamped on them at the rolling mill.

§ 179.300-8 Tank heads.

(b) Class DOT-106A tanks must have forged-welded heads, formed convex to pressure. Heads for forge welding must be torispherical with an inside radius not greater than the inside diameter of the shell. They must be one piece, hot formed in one heat so as to provide a straight flange at least 4 inches long. They must have snug drive fit into the shell for forge welding. The wall thickness after forming must be sufficient to meet the test requirements of § 179.300-16 and to provide for adequate threading of openings.

§ 179.300-9 Welding.

(a) Longitudinal joints must be fusion welded. Head-to-shell joints must be forge welded on class DOT-106A tanks and fusion welded on class DOT-110A tanks. Welding procedures, welders and fabrications must be approved in accordance with AAR Specifications for Tank Cars, Appendix W.

(b) Fusion-welded joints must be in compliance with the requirements of AAR Specifications for Tank Cars, Appendix W, except that circumferential welds in tanks less than 36 inches inside diameter need not be radiographed.

Commodity	Safety relief device	Valve protective housing	Miscellaneous
Chlorine trifluoride	Prohibited ¹		
Chloroform	Prohibited ¹	Gas tight ²	
Hydrofluoric acid	Prohibited ¹	Gas tight ²	
Hydrogen sulfide	Prohibited ¹		(3)
Methyl mercaptan	Prohibited ¹		
Nitrogen dioxide liquid	Prohibited ¹	Gas tight ²	
Nitrogen peroxide liquid	Prohibited ¹	Gas tight ²	
Nitrogen tetroxide liquid	Prohibited ¹	Gas tight ²	
Nitrogen tetroxide-nitric oxide mixtures	Prohibited ¹	Gas tight ²	
Nitrosyl chloride	Fusible plugs required		(4)
Phosgene	Prohibited ¹	Gas tight ²	
Pyroforic liquid, n.o.s.	Valve required		
Titanium tetrachloride (anhydrous)	Prohibited ¹		(2)
Vinyl chloride			(2)
Vinyl methyl ether			(2)

¹ When safety relief devices are prohibited, containers may be equipped with solid steel plugs in the safety device openings.

² The detachable protective housing for the loading and unloading valves must withstand tank test pressure without leakage and must be approved by the Bureau of Explosives.

³ All parts of valves and safety relief devices in contact with the lading must be of a metal or other material, suitably treated if necessary, which will not cause formation of any acetylides.

⁴ Tanks for nitrosyl chloride must be nickel-clad.

⁵ Valve outlets must have gas tight plugs or caps applied.

Interested persons are invited to give their views on this proposal. Communications should identify the docket number and be submitted in duplicate to the Secretary, Hazardous Materials Regulations Board, Department of Transportation, 400 Sixth Street SW., Washington, DC 20590. Communications received on or before October 5, 1971, will be considered before final action is taken on the proposal. All comments received will be available for examination by interested persons at the Office of the Secretary, Hazardous Materials Regulations Board,

§ 179.300-10 Postweld heat treatment.

After welding is complete, steel tanks and all attachments welded thereto, must be postweld heat treated as a unit in compliance with the requirements of AAR Specifications for Tank Cars, Appendix W.

§ 179.300-14 Attachments not otherwise specified.

Siphon pipes and their couplings on the inside of the tank head and lugs on the outside of the tank head for attaching the valve protective housing must be fusion-welded in place prior to postweld heat treatment. All other fixtures and appurtenances, except as specifically provided for, are prohibited.

§ 179.300-17 Tests of safety relief devices.

(b) Frangible discs of safety vents must be tested as prescribed in AAR Specifications for Tank Cars, Appendix A, A5.03.

§ 179.300-20 Reports.

(b) For builder's Certificate of Construction, see § 179.5 (b), (c), and (d).

(P) In § 179.301 paragraph (a), the table would be amended by adding "p.s.i." after the following entries.

"Start-to-discharge, or burst maximum p.s.i."
"Vapor-tight, minimum p.s.i."

(Q) Section 179.302 would be amended to read as follows:

§ 179.302 Special commodity requirements for multi-unit tank car tanks.

(a) In addition to §§ 179.300 and 179.301, the following requirements are applicable:

both before and after the closing date for comments.

This proposal is made under the authority of sections 831-835 of Title 18, United States Code, and section 9 of the Department of Transportation Act (49 U.S.C. 1657).

Issued in Washington, D.C., on August 16, 1971.

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Rear Admiral, Board Member,
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MAC E. ROGERS,
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